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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/809,379	03/15/2001	Erik C. Houge	ANTONELL 3-1-18-1-20	5771

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EXAMINER

STREGE, JOHN B

ART UNIT PAPER NUMBER

2625

DATE MAILED: 06/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/809,379

Applicant(s)

HOUGE ET AL.

Examiner

John B Strege

Art Unit

2625

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 April 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3,6,8-19 and 22-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3,6,8-19 and 22-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Response to Arguments***

1. This action is responsive to amendment A filed 4/19/04. Claims 4-5, 7, and 20-21 have been canceled.

2. In view of the amendment the rejections under USC § 102 of claims 1-3, 6, 8-9, 11, 17-19, 22-23,25 are hereby withdrawn. However, these claims as well as the other dependent claims are now rejected under 35 USC § 103 as discussed below.

Applicant's arguments with respect to claims 1-3, 6, 8-19, and 22-30 have been considered but are moot in view of the new grounds of rejection.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-3,6,8-10,14-19, 22-24, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jun et al. USPN 6,366,688 (hereinafter "Jun") in view of Fujita USPN 6,535,621.

Regarding claims 1-3, and 6 Jun discloses a system for detecting contact failures (defects) using a scanning electron microscope (at least col. 1 lines 14-15, and col. 6

line 65 to col. 7 lines 2). The scanning electron microscope reads image data for a semiconductor wafer (at least col. 2 lines 29-31, and col. 9 lines 25-27). An intensity profile is generated for the contact holes using the image data (at least col. 3 lines 42-45 and col. 9 lines 31-32). The intensity profiles are analyzed to identify contact failures (col. 9 lines 36-37). A vertical or horizontal line is placed at a first position of the image, and the intensity values along the line (intensity line) are summed to determine a total intensity for the line (col. 13 lines 6-8). This is repeated for multiple positions of the image (plurality of intensity lines) (col. 13 lines 8-12) to define the shape and structure of each hole in order to analyze the holes for contact failure (col. 13 lines 18-20, and 26-28). Multiple holes are checked for defects, thus defects are determined for each line. Furthermore Jun states that the dimension of the feature can be calculated by counting the number of pixel positions along a first dimension that exceed a threshold intensity thus providing motivation for counting pixels along a line which is one dimensional (col. 3 lines 62-66).

Jun does not explicitly disclose determining a defect density in the material's surface from the intensity line profile.

Fujita discloses a defect integrated processing of light and shade defects (col. 1 lines 8-9). A defective feature-detecting portion 92 calculates a sum of various features representative of the number of defect pixels (col. 12 lines 33-39). Furthermore an average density that corresponds to the number of various defective pixels is found (col. 12 lines 43-44). Fujita discloses that as a result of this various defects will be processed

in an integrated fashion to allow a detailed detection to obtain accurate defect information and the sizes thereof (col. 13 lines 25-28).

Jun and Fujita are analogous art because they are from the same field of endeavor of defect inspection.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Jun and Fujita to determine a defect density in the materials surface from the intensity line profile. The motivation for doing so would be to obtain accurate defect information about the size of the defects as stated by Fujita. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Jun and Fujita to obtain the invention as specified in claims 1-3, and 6

Regarding claim 8, Jun discloses that using the intensity a threshold is set, the background intensity value is subtracted from all the pixels, and a total number of intensity pixels is counted (at least col. 3 lines 58-67 continued on to col. 4 lines 1-3). Fujita discloses that the average density corresponds to the numbers of various defective pixels constituting one defect (col. 12 lines 42-44). The motivation for combining the references is the same as stated above.

Regarding claim 9, Fujita discloses determining the number of light defective pixels, the number of shade defective pixels, and the number of the respective pixels (col. 12 lines 33-44)(respective pixel can be read as background pixels).

Regarding claims 10 and 14, Fujita discloses an average defect density (col. 12 lines 43-44) where it is inherent that this is found by taking the number of defect pixels divided by the total number of pixels.

Regarding claim 15, as discussed Jun discloses that an intensity threshold is set when counting the pixels.

Claim 16 is dependent on claim 1 and discloses, "obtaining an image of an inner surface of a tubing located in a semiconductor wafer manufacturing facility." Jun nor Fujita do not explicitly disclose obtaining an inner surface of a tubing located in a semiconductor wafer manufacturing facility. However, one of ordinary skill in the art would know that a defect detection system can be used with various types of defects that occur in the production process. Therefore it would have been obvious to one of ordinary skill in the art to use the combination of Jun and Fujita as discussed to detect defects within semiconductor tubing manufacturing processes.

Claim 17 recites similar limitations as claim 1, thus the arguments used for the rejection of claim 1 apply equally to the limitations of claim 17.

Claim 18 recites similar limitations as claim 3, thus the arguments used for the rejection of claim 3 applies equally to the limitations of claim 18.

In regards to claim 19, Jun discloses that a computer is part of the processing unit (col. 7 line 33-34) (10 fig. 3) and the computer has a display (operator interface).

Claim 22 recites similar limitations as claim 8, thus the arguments used for the rejection of claim 8 applies equally to the limitations of claim 22.

Claim 23 is similar to claim 9, thus the same arguments apply.

Claim 24 is similar to claim 10, thus the same arguments apply.

Claim 28 is similar to claim 16, thus the same arguments apply.

5. Claims 11-13, and 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jun et al. USPN 6,366,688 (hereinafter "Jun") in view of Fujita USPN 6,535,621 and further in view of Lee et al. USPN 5,808,735 (hereinafter "Lee").

Claim 11 recites "the method as recited in claim 9 wherein the total number of intensity pixels comprise a histogram, and the background intensity pixels are inside a desired sigma value and the defect intensity pixels are outside the desired sigma value." Jun nor Fujita explicitly disclose this limitation.

Lee discloses a method for detecting and characterizing defects on a semiconductor wafer. A surface is scanned (col. 4 lines 32-35) and a three dimensional profile of the intensity of the surface is then prepared (col. 4 lines 44-46). This profile is used to detect defects on the tests surface (col. 3 ines 38-40). Lee recites that an intensity histogram is created with the defect pixels (col. 6 lines 23-26) as well as with the non-defect (background) pixels (col. 6 lines 34-37). Furthermore, Lee discloses an intensity threshold to differentiate between defect and non-defect pixels where those pixels that differ by an amount (sigma value) exceeding the intensity threshold are identified as defects (col. 6 lines 22-26). Lee recites that the method as used gives improved error-threshold optimization (col. 3 lines 20-21).

Jun, Fujita, and Lee are all analogous art because they are all from the same field of endeavor of defect inspection.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Jun, Fujita, and Lee to obtain a histogram for determining the defects. The motivation for doing so would be to achieve a more accurate error-

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threshold optimization. Thus it would have been obvious to combine Jun, Fujita, and Lee to obtain the invention as specified in claim 11.

Claims 12-13 specify setting the sigma value to be greater than two sigma, and 4 sigma.

At the time the invention was made it would have been obvious to a person of ordinary skill in the art to use sigma values greater than two sigma and four sigma because applicant has not disclosed that using sigma values greater than two sigma and four sigma provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with a different threshold such as that set by Lee. Therefore it would have been obvious for one of ordinary skill in the art to modify the combination of Jun, Fujita, and Lee to obtain the invention as specified in claims 12-13.

Claim 25 is similar to claim 11, thus the same argument applies.

Claims 26-27 are similar to claims 12-13, thus the same arguments apply.

6. Claims 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jun et al. USPN 6,366,688 (hereinafter "Jun") in view of Fujita USPN 6,535,621 and further in view of Henley USPN 5,406,213.

Claim 29 discloses the same limitations as claim 1 with the additional limitation of "rejecting the material based upon a number of the defects in the material's surface".



As discussed above Jun and Fujita combined disclose all of the limitations of claim 1. Jun does not explicitly disclose rejecting the material based on the number of defects.

Henley discloses a method for inspecting defects in liquid crystal display plates and recites, "if a certain number of permissible defects in a liquid crystal display element... is predetermined, a user is able to judge acceptance or rejection of liquid crystal display base plate based on the data resulting from the processed image" (col. 9 lines 22-28).

Jun, Fujita, and Henley are analogous art because they are from the same field of endeavor of defect inspection using image processing. At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Jun, Fujita and Henley in order to reject the semiconductor device based on the number of defects found. The motivation for doing so would be to apply the defect information gained in a manner to decide the quality of the product. Therefore it would have obvious to combine Jun and Henley in order to obtain the invention as specified in claim 29.

Examiner declares official notice for claim 30. Claim 30 states that the material is a subset of a batch of the material and rejecting includes rejecting the batch of the material. It is well known in the art to select from a lot of semiconductor wafers in order to speed up the inspection of wafers, since it is not efficient to inspect every wafer. Therefore the limitation of claim 30 would have been obvious to one of ordinary skill in the art at the time of the invention.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B Strege whose telephone number is (703) 305-8679. The examiner can normally be reached on Monday-Friday 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (703) 308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JS



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